

DEVELOPMENT AND BEHAVIOR WORKING GROUP
CORE HYPOTHESIS
SLEEP PROBLEMS/SLEEP DISORDERS

CORE HYPOTHESIS

Chronic sleep restriction, sleep disorders, and circadian timing modulations during critical phases of development have adverse effects on neurobehavioral function, social and emotional adjustment, risks for unintentional injury, and overall adult health status, after adjusting for potential confounds.

SUB-HYPOTHESES

Chronic sleep restriction, circadian timing modulation, and sleep disorders interact bi-directionally with other gene-environment influences to increase risk for potential adverse consequences.

Chronic sleep restriction, circadian timing modulation, and sleep disorders in susceptible children and adolescents (1) increase the occurrence of impaired school performance, impaired mood and behavior including attention deficits and hyperactivity or depression, (2) increase the risk for unintentional injury, and (3) exacerbate risk for obesity, insulin resistance and Type II diabetes, as well as adult-onset cardiovascular disease (including hypertension, coronary heart disease, stroke, and heart failure).

Chronic sleep restriction, circadian timing modulation, and sleep disorders present during pregnancy increase risk in susceptible women for sleep-disordered breathing, pregnancy-induced hypertension, pre-eclampsia, and preterm delivery and its complications.

Chronic sleep restriction, circadian timing modulation, and sleep disorders decrease adherence to compliance with other health promoting or maintaining behaviors, including but not restricted to motivation, diet and nutritional interventions, and exercise.

Ethnic and genetic factors in children may predispose to specific disorders of the sleep/wake or circadian timing system or behavioral dysregulation of sleep, leading to chronic sleep restriction.

PUBLIC HEALTH SIGNIFICANCE

Among the U.S. population, 50-70 million adults are estimated to have a sleep problem. The major public health issue is chronic sleep restriction related to life-style and other behavioral issues including shift work. In addition, almost half of these individuals have a sleep disorder that interferes with normal quality and duration of sleep and results in significant adverse public health consequences. The incidence of sleep problems in children and adolescents is at least as high as in adults, with chronic sleep restriction and difficulties with circadian timing particularly prominent in adolescents. These dysfunctions are likely associated with environmental exposures, but these associations have not yet been studied.

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JUSTIFICATION FOR LARGE COHORT STUDY

Sleep-related problems have complex bi-directional inter-relationships with multiple other influences on health and behavior. Associations with environmental, social, and cultural exposures are virtually unexplored, although quite likely. A large cohort is necessary in order to distinguish between cause and effect, to adjust appropriately for confounds, and to address the relation of sleep/wake difficulties to environmental exposures.

SCIENTIFIC MERIT

The adverse consequences of impaired sleep have bi-directional relationships with many other genetic and environmental influences affecting the health and well-being of children and adolescents. To understand mechanisms for identified associations in the National Children's Study, it will be necessary to document the extent to which insufficient, ill-timed, and impaired sleep and their consequences influence the observed adverse outcome, and the extent to which the effects of an adverse influence are mediated through impaired sleep quality. The quantity, timing,

and quality of sleep may contribute to a child's susceptibility to or resiliency against other environmental exposures.

POTENTIAL FOR INNOVATIVE RESEARCH

Sleep is a highly interdisciplinary biologic activity. The comprehensive nature of the National Children's Study provides a unique potential opportunity for collaborative research with multiple disciplines relevant to health and well-being in children and adolescents:

Primary Collaborative Opportunities With Other Working Groups:

Early Origins of Adult Health

Gene-Environment Interactions

Injury

Social Environment

Nutrition, Growth and Pubertal Development

Secondary Collaborative Opportunities With Other Working Groups:

Birth Defects

Exposure to Chemical Agents

Pregnancy and Infant

Health Disparities

Health Services

Immunity, Infections and Vaccines

Recruitment and Retention

FEASIBILITY

Baseline and longitudinal information regarding sleep duration, circadian timing, and primary symptoms of a sleep disorder, including excessive daytime sleepiness, can be obtained in all enrollees using standardized instruments and questions. Instrument development may be required

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for certain developmental stages. Genetic screening for markers predisposing to specific sleep disorders or circadian timing modulations is also possible.

More detailed evaluations of sleep and circadian timing, along with assessment of daytime sleepiness, neurobehavioral deficits, and other adverse consequences of poor sleep can be performed in selected subsets, particularly as related to subhypotheses regarding the association of problem sleep with increased susceptibility to effects of other environmental exposures.

Furthermore, the incidence of specific sleep and circadian rhythm disorders may vary as a function of ethnicity or genetic factors; such associations can only be exposed with targeted assessments in a large cohort study.

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